

DRAWING AMENDMENTS

Please amend FIG. 23 as highlighted in red on the Annotated Marked-up Drawings Sheet attached hereto and reflected in the Replacement Sheet also attached hereto. An explanation of these amendments along with support in the specification for these amendments is provided below.

Please delete block "Virtual Tape Drive Empty?" and associated connecting lines, labels and reference numeral 2305. This block is not referenced in Spec. ¶[0070].

Please add block "Prevent Media Removal Active?" and block "Report Illegal Request" and associated connecting lines, labels and reference numerals 2310, 2312. See Spec. ¶[0070], as amended:

if the load bit is set to zero, the prevent media removal state of the virtual tape drive is checked to allow the virtual tape drive to be unloaded. If prevent media removal is active **2310**, the unload command is terminated with a check condition status with a request sense data buffer constructed to report an illegal request **2312** error condition; and the request sense data buffer flag is set to a valid state. If prevent media removal is not active, the volume data management table is updated **2315**

Further, please combine block 2315 and block 2325 as a single block 2315, deleting reference numeral 2325 not referenced in the specification. Add a connecting line to block 2335. See Spec. ¶[0070], as amended:

If prevent media removal is not active, the volume data management table is updated **2315** to record any pending write operations and the volume management table is updated to indicate the virtual tape drive is empty **2315**. If the previous virtual tape volume was not the last volume **2335**

...

Finally, for readability, please allow the relocation on the Replacement Sheet of the resulting blocks, connecting lines and reference numerals as compared to the Annotated Marked-up Drawings Sheet.

REMARKS

Applicant respectfully requests reconsideration of this Application in light of the foregoing amendments and the following remarks. In the Office action mailed 05/03/2006, claims 1-14 were pending. Claims 3 and 4 were rejected under 35 USC § 112 as indefinite. Claims 1-3, 5-7 and 10-14 were rejected under 35 USC § 102(b) as being anticipated by U.S. Pat. No. 5,455,926 to Keele et al. Claims 4, 8 and 9 were objected to as being dependent upon a rejected base claim. Accordingly, claims 1-14 have been canceled and claims 15-25 have been added. Thus, claims 15-25 are currently pending and addressed below.

In General

The installed base of data backup application programs are configured for tape storage because of the historically low media cost, large storage capacity and removable media characteristics of tape storage devices. Disk storage viewed as a tape provides relatively fast data transfer rates and random access. The operational characteristics of disk storage and tape storage, however, are incompatible. A drawback of prior art attempts to emulate tape storage is the need for custom developed emulation programs for each tape storage device.

Advantageously, the claimed tape storage emulator works with a wide-variety of tape devices without the need to develop emulation programs for each device. In particular, the personality logic captures responses of an attached tape device to common non-media tape commands. This tape device "personality" is stored in a personality table and retrieved so as to emulate the tape device. See Specification [0031]; Figures 4 and 7.

The Office action cited Keele reference discloses a "MOST Controller" that emulates only one type of tape storage device. Keele col. 18, line 45 ("MOST emulates the IBM 3480 tape subsystem"); lines 45-47 ("Programs written for other tape subsystems . . . may require some Job Control Language modification"). Nowhere does Keele disclose a mechanism whereby the non-media response of an attached tape storage device is captured so that a virtual tape controller appears to a server as that tape device. Indeed, Keele does not disclose that the MOST Controller is even

capable of attachment to a tape storage device, much less that it is capable of capturing a tape storage device response to non-media commands so as to emulate the tape storage device.

Claim Rejections - 35 USC § 112

Claims 3 and 4 were rejected under 35 USC § 112 as indefinite. In particular, the Office action states that "the phrase 'common media commands' renders the claims indefinite because the claims include elements not actually disclosed . . ." Office action, page 2, paragraph 1, emphasis added. Claims 3 and 4, however, did not contain the Office action referenced phrase "common media commands." Rather, claims 3 and 4 cited "common non-media commands," for which there is ample support in the Specification. As examples:

When a tape storage device is attached, personality logic **1150** captures all of the common non-media access commands during the initialization sequence.

Specification paragraph [0051] (emphasis added).

Further, the initialization sequence **1110** auto discovers archival tape storage devices and captures the response data for the common commands shown in TABLE 1. In addition the initialization sequence **1110** auto discovers archival media changers/robot devices and captures the response data for the common commands shown in TABLE 2.

Specification paragraph [0047] (emphasis added).

FIGS. 27-33 illustrate the non-media commands.

Specification paragraph [0075] (emphasis added). Comparing FIGS. 27-33 to TABLES 1 and 2, it is clear that the common commands listed in those tables are non-media commands.

These rejections of claims 3 and 4 are now moot in that claims 3 and 4 are canceled. This point is raised herein, however, because the term "common non-media commands" is used in the new claims listed above, and it is Applicants' assertion that this term is not indefinite for the reasons stated above.

Claim Rejections - 35 USC § 102 as to Keele

FIGS. 4 and 7 from the Application are reproduced below to illustrate aspects of the claims that overcome the rejections cited above and distinguish the art of record.

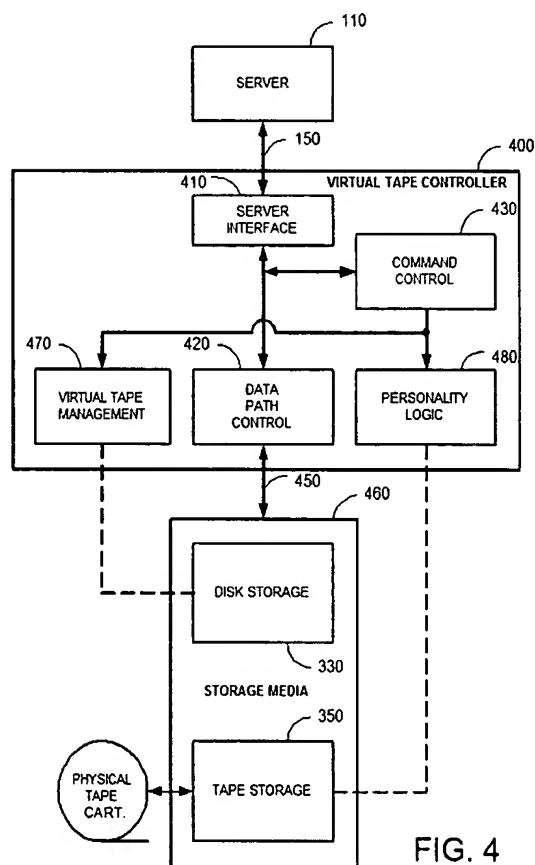


FIG. 4

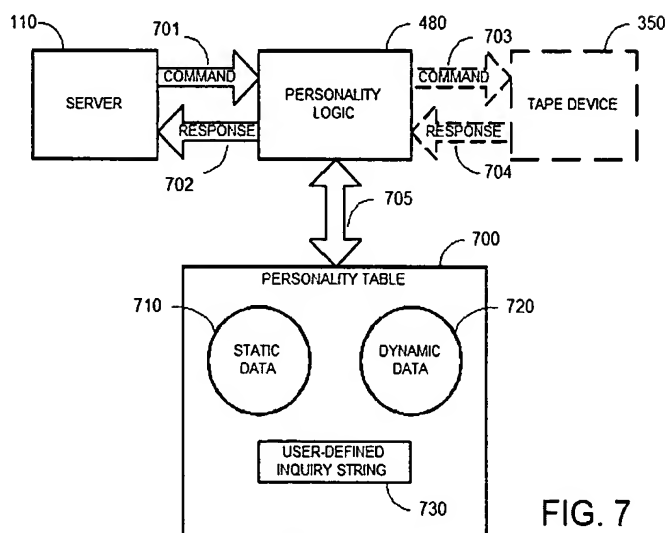


FIG. 7

Claims 15-17

Claim 15 cites:

A tape storage emulation method comprising:
providing a virtual tape controller 400 in communications with a server 110, a disk storage device 330 and a tape storage device 350;
storing 705 in the virtual tape controller a plurality of non-media command responses 704 captured from the tape storage device;
receiving a non-media command 701 in the virtual tape controller from the server;
sending to the server from the virtual tape controller a stored one of the non-media command responses 702 corresponding to the received non-media command;
receiving a media command 701 in the virtual tape controller from the server; and
applying the media command to a virtual tape controller managed virtual tape volume 500 (FIGS. 5A-B) configured on the disk storage device.

(Reference numerals added with respect to FIGS. 4 and 7).

Keele does not disclose providing a virtual tape controller in communications with a tape storage device. With respect to claim 10 (canceled) the Office action asserts that Keele teaches "providing a virtual tape controller adapted to communicate with a server, a disk storage and a tape storage" Office action, page 5, paragraph 7 (referencing Keele col. 22, lines 41-43; col. 16, lines 65-67). Keele (col. 2), however, refers to "a MOST Controller, optical disk drives and optional jukebox." Nowhere is there mention that the MOST Controller communicates with a tape storage device. Indeed, Keele Fig. 1 only illustrates the MOST Controller 14 interfacing with optical disk drives 16a, b; an optical disk jukebox 18; operator consoles 24, 26; a printer 28 and a telephone 30. Keele (col. 16) refers to the IBM System 370, which "consists of . . . reel and cartridge magnetic tapes." The Office action, however, cannot interchangeably reference the IBM System 370, which is a mainframe computer 12 (Fig. 1), and the MOST Controller 14 (Fig. 1) in rejecting Applicants' claims. Specifically, the Office action must consistently relate the IBM mainframe to the claimed server element and the MOST controller to the claimed virtual tape controller element. As such, Keele cannot read on the providing step of claim 15.

The Office action does not specifically address the step of storing non-media command responses captured from the tape storage device. The Office action does assert that Keele teaches "capturing at least a portion of said response data from said tape storage device in response to said common nonmedia commands." Office action page 3, paragraph 3 (referencing Keele col. 104, lines 60-62). Keele (col. 104), however, is a reference to internal flags of the VMEGate 36 (Fig. 2) of the MOST Controller 14 (Fig. 2). Keele does not teach that these internal flags are non-media command responses captured from a tape storage device, as claimed. Indeed, as pointed out above, the MOST Controller has no communications with a tape storage device. As such, Keele cannot read on the storing step of claim 15.

Keele does not disclose sending to the server a stored one of the non-media command responses. With respect to claim 1 (canceled) the Office action asserts that Keele teaches "sending said response data to said server in response to said non-media command." Office action page 3, paragraph 1 (referencing Keele col. 38, lines 61-64; col. 104, lines 53-65). Keele (col. 38), however, discloses "The emulation is accomplished through microcode in the VMEGate and software in the SBC." This teaches away from claimed invention where emulation is not accomplished through microcode and software, but rather through non-media command responses captured from a tape storage device, stored in the virtual tape controller and sent to the server in response to a non-media command. Keele (col. 104) again references internal flags, which are discussed and distinguished in the paragraph above. As such, Keele cannot read on the sending step of claim 15.

For all of the above stated reasons, claim 15 is not anticipated by Keele. Claims 16 and 17, which depend from claim 15 are likewise not anticipated by Keele. Claims 16 and 17 are not anticipated by Keele for the additional reasons discussed immediately below.

Claim 16 cites:

The tape storage emulation method according to claim 15 further comprising:

sending a plurality of common non-media commands 703 from the virtual tape controller 400 to the tape storage device 350 during an initialization sequence 1100 (FIG. 11A); and

capturing 705 at least a portion of the response 704 of the tape storage device to the common non-media commands for storage in a personality logic portion 480 of the virtual tape controller.

(Reference numerals added with respect to FIGS. 4 and 7).

Keele does not disclose sending common non-media commands from the virtual tape controller to a tape storage device during an initialization sequence. With respect to claim 3 (canceled) the Office action asserts that Keele teaches such a sending step. Office action, page 3, paragraph 3 (referencing Keele cols. 53-65). Keele (cols. 53-61) cites functions of "a simulated IBM 3480 control unit operator setup panel." See Keele col. 51, line 1. In particular, these are commands sent from the MOST Controller to the optical disk drives, which are disk storage devices and not a tape storage device as claimed. "MOST emulates the IBM 3480 tape subsystem, that is, it appears to an attached host computer to be a standard tape subsystem." Keele col. 18, lines 49-51 (emphasis added showing an admission that MOST is not a tape storage device). As such, Keele cannot read on the sending step of claim 16.

Further, Keele does not disclose capturing the tape storage device response to common non-media commands in a personality logic. With respect to claim 3 (canceled), the Office action asserts that Keele teaches a capturing step. Office action, page 3, paragraph 3 (referencing Keele col. 104, lines 60-62). As noted with respect to claim 15, above, Keele (col. 104) is a reference to internal flags of the VMEGate, and Keele does not teach that these internal flags are non-media command responses captured from a tape storage device. Indeed, as pointed out above, the MOST Controller has no communications with a tape storage device. As such, Keele cannot read on the capturing step of claim 16. For all of the above stated reasons, claim 16 further patentably distinguishes Keele.

Claim 17 cites:

The tape storage emulation method according to claim 16 further comprising:
determining that the non-media command is not one of the common non-media commands;
sending the non-media command to the tape storage device 350; and
capturing a response from the tape storage device to the non-media command for storage in the personality logic 480 portion of the virtual tape controller 400.

(Reference numerals added with respect to FIGS. 4 and 7).

With respect to claim 4 (canceled), the Office action admits that Keele does not teach the combination of determining, sending and capturing steps of claim 4. Office action page 6, paragraph 12. Similarly, Keele does not read on any of the determining, sending and capturing steps of claim 17, which further patentably distinguishes Keele.

Claims 18-21

Claim 18 cites:

A tape storage emulator comprising:
a server interface 410 that communicates media commands and non-media commands 701 from a server 110;
a virtual tape manager 470 in communications with the server interface so as to provide the server access to virtual tape volumes on a random access storage device 330 in response to the media commands;
a personality logic 480 in communications with the server interface so as to provide the server with non-media command responses 702 to the non-media commands; and
a personality table 700 in the personality logic that stores 705 the non-media command responses, which are captured from a sequential access storage device 350 in communications with the personality logic.

(Reference numerals added with respect to FIGS. 4 and 7).

Keele does not disclose a personality table that stores non-media command responses captured from a sequential access storage device. The Office action admits that Keele does not teach the personality table cited in claim 8 (canceled). Office action page 6, paragraph 13. Further, as argued with respect to claim 15, above, Keele does not disclose storing non-media command responses captured from the tape storage device. For these reasons, claim 18 is not anticipated by Keele. Claims 19-21, which depend from claim 18 are likewise not anticipated by Keele. Claims 19-21 are not anticipated by Keele for the additional reasons discussed immediately below.

Claim 19 cites:

The tape storage emulator according to claim 18 wherein the personality logic 480 initializes the personality table 700 by sending a plurality of common non-media commands 703 to the sequential access storage device 350 and by storing the sequential access storage device responses in the personality table.

(Reference numerals added with respect to FIGS. 4 and 7).

Keele does not disclose the personality table is initialized by sending common non-media commands to a sequential access storage device and storing the responses. As noted above with respect to claim 15, Keele does not disclose a sequential access storage device attached to the MOST Controller described therein. Also, as noted with respect to claim 16, Keele does not teach that internal flags of the VMEGate, cited by the Office action, are non-media command responses captured from a sequential access storage device. As such, claim 19 further patentably distinguishes Keele.

Claim 20 cites:

The tape storage emulator according to claim 19 wherein the personality logic 480 updates the personality table 700 when one of the non-media commands from the server is other than one of the common non-media commands.

(Reference numerals added with respect to FIGS. 4 and 7).

Keele does not disclose that the personality table is updated when a server non-media command is not one of the common non-media commands. With respect to claim 4 (canceled), the Office action admits that Keele does not teach determining a non-media command is not one of the common non-media commands; sending the non-media command to the tape storage device; and capturing a further portion of the response data from the tape storage device in response to the non-media command. See Office action page 6, paragraph 12. Thus, claim 20 further patentably distinguishes Keele on this basis.

Claim 21 cites:

The tape storage emulator according to claim 20 wherein the personality table comprises:

a static data section that maintains responses to inquiry and read block limit commands; and

a dynamic data section that maintains responses to mode select and log select commands received from the server.

With respect to claim 8 (canceled), the Office action admits that Keele does not teach a personality table storing static data and dynamic data portions of response data. See Office action page 6, paragraph 13. Thus, claim 21 further patentably distinguishes Keele on this basis.

Claims 22-25

Claim 22 cites:

A tape storage emulation method comprising:
providing a virtual tape controller 400 having personality logic 480, the virtual tape controller in communications with a server 110 and a disk storage device 330;
attaching a tape storage device 350 to the virtual tape controller so as to establish communications between the virtual tape controller and the tape storage device;
sending a plurality of common non-media commands 703 from the virtual tape controller to the tape storage device so as to obtain responses 704 from the tape storage device;
storing the responses in the personality logic 480;
receiving a non-media command 701 from the server; and
communicating to the server from the personality logic a response 702 corresponding to the non-media command so that the virtual tape controller appears to the server as the tape storage device.

(Reference numerals added with respect to FIGS. 4 and 7).

Keele does not disclose attaching a tape storage device to a virtual tape controller so as to establish communications. As argued with respect to claim 15, above, Keele does not disclose providing a virtual tape controller in communications with a tape storage device. As such, Keele reads on none of the attaching, sending storing or communicating steps of claim 22.

Keele does not disclose sending common non-media commands from the virtual tape controller to the tape storage device. This is readily apparent because, as noted immediately above, Keele does not disclose a tape storage device in communications with a tape storage device. Likewise, Keele does not disclose to obtain responses from a tape storage device.

Neither does Keele disclose storing responses in personality logic. The Office action argues that internal flags of the VMEGate on the MOST Controller are stored responses to non-media commands. See argument with respect to claim 15, above. Keele, however, does not teach that these internal flags are captured from a tape storage device in response to common non-media commands.

For all of the above stated reasons, claim 22 is not anticipated by Keele. Claims 23-25, which depend from claim 22 are likewise not anticipated by Keele. Claims 23-25 are not anticipated by Keele for the additional reasons discussed immediately below.

Claim 23 cites:

The tape storage emulation method according to claim 22 further comprising:
receiving an additional non-media command from the server;
determining that the responses in the personality logic do not correspond to the additional non-media command;
forwarding the additional non-media command to the tape storage device so as to obtain an additional response from the tape storage; and
communicating to the server the additional response to the additional non-media command.

With respect to claim 4 (canceled), the Office action admits that Keele does not teach determining a non-media command is not one of the common non-media commands; sending the non-media command to the tape storage device; and capturing a further portion of the response data from the tape storage device in response to the non-media command. See Office action page 6, paragraph 12. Similarly, Keele does not disclose the limitations of claim 23, and thus, claim 23 further patentably distinguishes Keele.

Claim 24 cites:

The tape storage emulation method according to claim 22 further comprising:
removing the tape storage device from the virtual tape controller;
attaching a second tape storage device to the virtual tape controller;
sending the common non-media commands from the virtual tape controller to the second tape storage device so as to obtain second responses from the second tape storage device; and
storing the second responses in the personality logic so that the virtual tape controller can emulate the second tape storage device response to non-media commands.

See Specification paragraph [0024]: "The personality logic 480 emulates particular tape devices that are either optionally attached as tape storage 350 or are user defined." Paragraph [0031]: "Advantageously, the personality logic 480 emulates a wide-variety of tape devices without the need to develop emulation programs for each device." Paragraph [0042]: "As shown in FIG. 9A, in one VTC embodiment 400, the device array channels 450 each support either disk or tape storage devices." Paragraph [0047]: "the initialization sequence 1110 auto discovers archival tape storage devices and captures the response data for the common commands shown in TABLE 1."

As argued above, Keele discloses only a single emulation, that of the IBM 3480. Other emulations must be programmed. Also, there are no tape storage device attachments to the MOST controller. Further, Keele does not disclose emulating tape storage devices by attaching tape storage devices to obtain and store responses to non-media commands. Claim 24 further patentably distinguishes Keele for these reasons.

Claim 25 cites:

The tape storage emulation method according to claim 24 further comprising:
a personality table storing a static data portion of the response data and a dynamic data portion of the response data,
wherein the static data is initialized by responses of the sequential access data storage to inquiry and read block limit commands, and
wherein the dynamic data is maintained in response to mode select and log select commands received from the server.

As argued above with respect to claim 21, and noted with respect to claim 8 (canceled), the Office action admits that Keele does not teach a personality table storing static data and dynamic data portions of response data. See Office action page 6, paragraph 13. Similarly, Keele does not disclose the limitations of claim 25, and thus, claim 25 further patentably distinguishes Keele.

Summary

In light of the foregoing amendments and remarks, Applicants respectfully submit that claims 15-25 are in condition for allowance. Applicants request that these claims and this application be passed to issuance. If the Examiner believes that any issue remains that requires clarification, however, the Examiner is invited to call the undersigned attorney of record at the number indicated below.

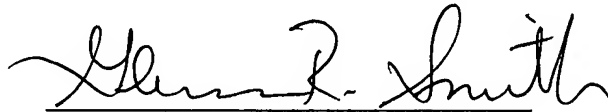
Respectfully submitted,

LAW OFFICE OF GLENN R. SMITH

Dated: _____

11/03/2006

By: _____



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